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[redacted]

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[redacted]

Comments on S&T Input to Study of Issues e, f, and h

Issue e: We do not agree with the approach proposed by the S&T representative. We believe that the DDI objectives have been under intensive study and test for years and are refined and clearly spelled out in the SAFE Functional Requirements document. After considering design alternatives, a modular approach has been selected as the best means of satisfying the DDI objectives while at the same time retaining the degree of flexibility needed to react to expected change. The S&T approach would result in a zero base reexamination which would set back the schedule by several years. There is little, if anything, to be gained by this approach.

Issue f: We generally agree with the project management philosophy expressed in the S&T paper. It is our intent to manage the project much in the manner suggested. We do not feel that retaining firm control of system design and implementation, as we plan to do, is contrary to this philosophy. We are confident that our current project management staff, augmented by our approved staffing plans, is fully capable of managing the successful implementation of the SAFE project.

Issue h: We do not think it is wise to delay assembling the most "expert" SAFE team we can while the question of "contractor engagement strategy" is being debated. The fact is that the SAFE project is moving forward. We have an approved SAFE

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management plan which spells out the organization, functions, authorities and responsibilities. The skills needed to staff this organization are apparent and we are engaged in a vigorous effort to recruit. We have asked the DDS&T to identify personnel whose expertise can be used in various capacities in the organization. We have had no reply to this request. In the meantime, we are filling vacancies that could have been filled by the S&T nominees, because we need people to do the work.

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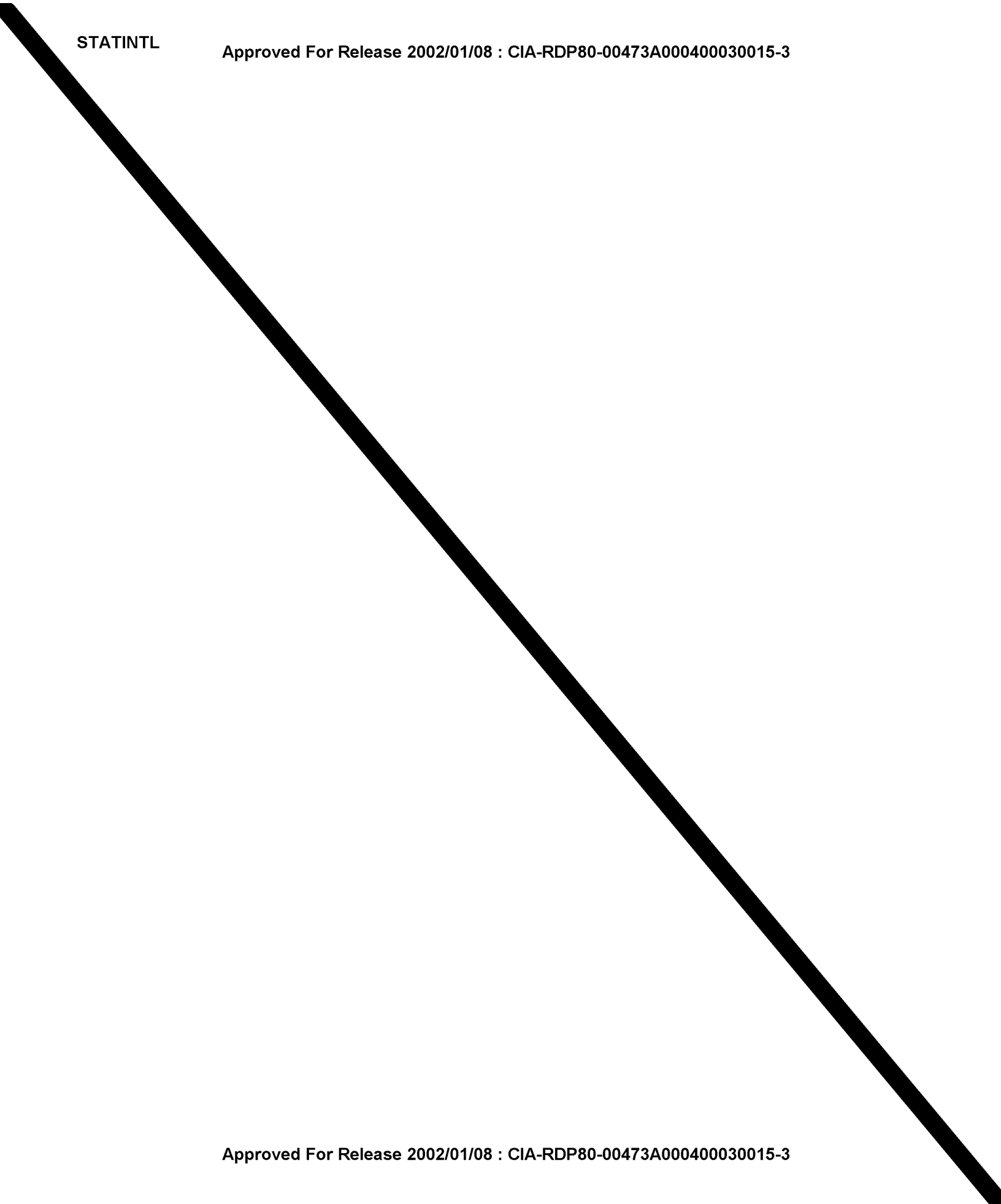

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DDI 77-0744

ODP 233-77
9 February 1977

MEMORANDUM FOR: Deputy Director for Administration

FROM : Clifford D. May, Jr.
Director of Data Processing

SUBJECT : Response to Issues Raised by DDI

1. Enclosed for your information and further distribution are the discussion papers we prepared in response to SAFE Issues e, f and h raised by the DDI. Copies of these papers have been given only to [redacted] STATINTL

2. In developing the enclosed responses, [redacted] STATINTL
STATINTL met with [redacted] of OCR and [redacted] of DDS&T, STATINTL
once jointly to outline the information needed, and then individually in person and by phone to coordinate the responses. Both provided some written material [redacted] is enclosed) STATINTL
but the exchange was primarily oral. There are no "minority" opinions.

STATINTL 3. [redacted] has discussed his comments with Les Dirks but has not shown him his memo. We are "separated in position more by semantics than substance" according to Bob. Regarding Issue 1 (e), he feels that since some key players in DDI and DCI have changed, we should reaffirm the SAFE objectives before deciding on the "kind of system." This will be addressed in the response to DDI's Issue a. His response on Issue 3 (h) came in after our paper was completed but had been discussed earlier. The "authority" and "direction" referred to in his discussion of Issue 3 are clearly Project Office responsibilities. The types of personnel we need for the Project Office Staff and consulting panels have been outlined to Bob.

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STATINTL 4. [redacted] is in agreement with our papers except as they become specific in trade-offs [redacted] However, he will be a party to any trade-offs we will make during the development program.

[redacted] STATINTL

Clifford D. May, Jr.

Att: a/s

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STATINTL MEMORANDUM FOR: [redacted]

SUBJECT: DDI Issues

1. Attached you will find the discussions of the three (3) DDI issues we were addressing. They are consistent with our earlier conversation. The other key questions you identified were, of course, the expected increase in goods and services and those functions which require staff resources.

2. To review our discussion, we agreed that a 6-8% cost growth factor could be anticipated each year for goods and services and that a 15-20% cost growth could be anticipated over the life of the program due to the R&D nature of the effort. Additionally, I identified the need for a very well organized and well staffed configuration management office and pointed out that this function, if properly carried out, would require considerable staff resources beyond those identified in our earlier discussions.

3. If I can be of any further help please contact me.

STATINTL [redacted]

Chief, R&D Planning Staff
Directorate
of
Science and Technology

Attachment: a/s

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Issue Number 1 (e)

What kind of system should we design that will account for the cost growth over the length of the effort if we are to stay within the [redacted] limit? STATINTL

A direct answer is not currently available. Attempts have been made to defer or eliminate requirements in order to "fit" within the [redacted] limit, but this exercise STATINTL may well result in a baseline system that meets very few DDI objectives.

To address this issue, a re-confirmation of DDI objectives is necessary. What is the DDI attempting to achieve, what benefits are expected, and what priority is the objective? This statement can then become the basis of a rigorous examination of alternate approaches, including non-ADP, that could, within acceptable bounds, meet the stated objective. Each proposed approach must also factor in expected implementation costs and identify the trade-offs made to achieve that cost figure.

Given the alternate approaches and costs needed to satisfy each objective, the priority of that objective, the anticipated gains of having achieved the objective then the question posed above can be readily addressed.

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Issue Number 2 (f)

Can a Project Office within CIA do the job of integrating and directing segment contractors in view of other demands and Government manning inflexibility?

The accepted role of a project office is the management of the project; that is, planning, organizing, directing, monitoring and controlling. With limited resources, any other functions assumed by the project office detracts from its ability to perform the critical management functions.

Experience has shown that during the implementation of some small and medium sized systems, this thesis has been successfully violated by dedicated groups of highly experienced Government and contractor personnel. That is, the Government assumed the added responsibility for implementing a part of the system. During the implementation of large systems, however, the opposite tends to be true. That is, contractor resources are required to fulfill the basic management tasks because of the manning inflexibilities of the Government and because of the anticipated workload in those management areas that require pure Government support.

In light of the anticipated size of the SAFE system, it is inadvisable to assume responsibilities for the Project Office other than those required to manage the system. Perhaps the real question is:

> "Are the resources allocated to the Project Office sufficient and of the right type to successfully manage the project?"

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How can we engage the large software expertise of the DDS&T in the project:

Knowledge of the final Project Office role and its relationship with the contractors is necessary before rational engagement strategies for the DDS&T can be evaluated. The options, of course, range from transferring people, to establishment of review panels. Each option, however, is plagued by many questions; i.e.,

(1) What type of people?

(2) What authority?

(3) Under whose direction?

that will only be answered when the Project Office/ contractor engagement strategy is resolved.

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ISSUE #1 (e)

What kind of a system should we design that will account for cost growth over the length of the effort, if we are to stay within the $35M limit?

1. SUMMARY:

The system developed must satisfy the users' needs as defined in the Functional Requirements Document and must be adaptable to changing needs in the future. Cost will escalate both through inflation and normal need changes. Reserves will be programmed within the budget limit to accommodate reasonably estimated growth. The system must be made up of general-purpose components for adaptability and may serve fewer users with small data base initially while preserving system reliability, responsiveness, ease of use and the flexibility to accommodate change.

The system will be made up of quasi-intelligent terminals, a broad-band communications network, general purpose processors using commercially available data storage, adaptations of commercial systems software and new applications software. It will have capacity and cost flexibility in the terminal, storage and (to a degree) processor areas.

2. BASIC REQUIREMENT TO BE MET:

The system must have certain characteristics if it is to be useful in the CIA environment. The purpose of the system is to assist the analyst in the production of more timely, more thoroughly researched and analyzed intelligence. It will do this by providing more timely and accurate dissemination of incoming information, by providing efficient search and retrieval capabilities for both electrically and mechanically stored elements in the total data base available, by expediting composition and coordination of reports, by providing to the analyst private filing capabilities and by providing interconnections to other information systems as desired.

In addition to providing tightly customized functions, the system must be general purpose in the sense that new applications, new data bases, and new modes of operation can be accommodated by changing software or hardware without taking the system out of service. It further must be very reliable if its capabilities are to be really useful to the analyst.

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3. BASIC DESIGN PHILOSOPHY:

These functions and requirements indicate a system in which all users are interconnected both to one another and to the large central data base. Substantial computer processing power is required to accommodate a data base of this size and a high capacity communication system and a user-oriented terminal facility are essential. The degree to which the system can be centralized or distributed functionally or geographically is a question to be answered in the design effort. The answer impacts both cost and flexibility to adapt the system to the changing needs over the years.

The requirement to use the system for a variety of needs (some of which are not currently predictable) over the years dictates the use of commercial general purpose computing equipment and storage as opposed to custom developed devices. A properly conceived system will accommodate change in much the same manner that a general purpose computer center does in the current day. Special purpose processors will be considered only where some very substantial gain in performance at reduced cost is possible and where such device is exected to be useful over a 6-10 year period.

4. COST ESCALATION:

In addition to the problem of living within a $35M limit (which limit is arbitrarily imposed), the program must adapt to year by year changes to the requested budget which might extend the program or change the overall program dollars available. In all initial budget estimates the clear direction was given to avoid including an inflation factor. This indicates that [redacted] in todays dollars STATINTL
STATINTL will not buy [redacted] worth of system over a four year period. For what type of cost growth then should we plan?

Cost trends in terminal storage and processing equipment are expected to be level. Our initial estimates were based on current GSA prices and we feel that negotiated procurements can better these prices. Further, the trend for more computing power for the same dollars would indicate that even with general escalating price lists the cost in the 3-5 year period should be relatively constant.

Labor intensive activity is expected to escalate at approximately 8% per year.

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The more worrisome aspect of cost escalation is that historically encountered in large program, particularly software, development over the years. Overruns of 20-120% are often encountered and the systems often provide less operational capability than was originally contracted for. The general causes of such overruns in order of likelihood are as follows:

a. Inadequate specification of tasks to be performed.
Generally speaking the goals and objectives of many large software tasks are not specified in adequate detail to permit concise generation of cost estimates. They further tend to be ambiguous and leave a great deal of opportunity for error in implementation.

b. Change in goals.
As a result of the above and also as a result of the closer examination of objectives of the system being developed during the implementation phase, there is a tendency to modify or change system functions during the implementation. This often occurs without total acknowledgment by all parties that this is occurring and results in extra effort or extra time and generally extra cost which was not planned.

c. Schedule changes.
Both of the above factors can result in changes to a schedule as can a number of other factors. Generally speaking the acceleration of an effort to make an unrealistically short schedule by increased application of manpower and facilities or the extension of a schedule once a full team is working on a project will substantially increase cost. If the schedule can be kept under control the cost will fall in line.

d. Poor management.
Software development projects have a history of starting work without adequately defined objectives and plans and failing to take proper notice and corrective action when plans are not followed. This coupled with generally poor contracts in the software development area and the lack of application of proper methodology can result in substantial cost overruns.

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It is obviously more difficult to deal with the surprises generated by the above factors and other areas of omission and commission than it is with the more generally predictable escalation in the cost of goods and services. The plan for dealing with the above factors is to partition and define the system into manageable components large enough to provide purchasing leverage due to the volume but at the same time small enough to provide detailed management visibility throughout the specification, design, development and testing process. Even in the case where multiple software elements may be under development by the same vendor, this partitioning and visibility will be maintained. For the risks that are incurred reserve funds within the $35M will be set aside to cover projected probable cost increases. Such funds will be reserved even at the cost of purchasing fewer terminals, less storage and fewer functions which would optimally be desired.

5. OPPORTUNITIES FOR CONTAINING COSTS:

a. Functions/Capacity Tradeoff.
In view of the funding limitations and uncertainty and the probable escalation of cost in some elements of system development, there are functions which must be planned for trading off against one another and against cost in order to design to cost. STATINTL

The first obvious category is system function/capacity trade-off. System plans have already been pared [redacted] This number may be further reduced, particularly for an initial offering. Additional terminals could be acquired at the users expense.

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A study of the database will determine which segments are most frequently used and are most critical to the analyst and will indicate a hierarchy of storage rather than a homogenous ten year storage, leading to the use of fewer high-cost disks. In particular the amount of data online for 'instantaneous' access might be less than 10 years-worth for most files with slightly longer accesses for information that is older and less frequently accessed.

b. Purchase vs. Lease.
Purchase vs. lease of major elements of the system will very substantially change the initial cost of the system. This may be advisable in any event if the initial equipment ordered is to be replaced by a later model within the relatively short term future. Lease, long term

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lease and extended purchase options will be examined for all elements of the system. Lease or long term purchase would be more expensive in the long run but these approaches may offer another means of containing cost for initial SAFE implementation.

c. Joint Development.
We shall continue to look for joint development or procurement activities within DIA for this is not viewed as a solution to the expected cost changes but rather as a method of saving money on two overall programs. The combined funding of the two programs is over
STATINTL [redacted] and at least 6 areas offer opportunities for joint development. It is expected that some overall savings will be achieved through joint development.

6. SYSTEM TYPE:

The type of system which is amenable to this type of manipulation as well as to meeting the requirements for a long-term, on-going utility is as follows:

A central hardware facility consisting of mass storage which is expandable to 50 billion characters, but which is initially 1/10 of that, a number of general purpose computers with high I/O capacity and high speed processing capability, a communications system which provides adequate bandwidth for full system operations including remote image distribution, a number of minicomputers located either centrally or at strategic sites in the building to provide basic terminal support functions and a set of quasi-intelligent terminals providing some data manipulation capacity in their own right and which adapt to a range of interface needs and to the various applications within the system.

All processors will operate under the same operating system such that any of the major processors can run any or all of the major system applications programs and the system can be made to degrade somewhat gracefully in the event of failure.

The software will consist of some necessary modification to the operating system but will be primarily composed of application programs written in higher level languages operating within a general-purpose environment.

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Special purpose processors might be encountered in the area of text search if the current R&D activity produces such a machine and if it can be accommodated in the general computer environment outlined above. In other words special purpose equipment will be accommodated only to the degree that it can be driven by the general purpose processors.

7. ACQUISITION STRATEGY:

The acquisition strategy to be followed to retain the necessary reserves against cost escalation is as follows:

1. Lease or use extended purchase options to reduce the initial cash commitment and hold the uncommitted funds until the last quarter of the fiscal year to cover unexpected cost increases. Then the funds would be used for purchase if not needed. Approximately $2M can be reserved in this manner in FY-78 and 79.

2. Limit the system [redacted]. This reserves $2M at purchase price. STATINTL

3. Contract for no more than 85% of available software dollars until the last quarter of each year. [redacted]. Unused funds would be used in the fourth quarter of contract for work in the following fiscal year. STATINTL

4. Contract for complete software functions such that each contractor has performance responsibility for a defined task which is tested and integrated with the remainder of the system. Definition and control will minimize the likelihood of schedule and scope changes.

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ISSUE #2 (f)

Can a project office within the CIA do the job of integrating and directing segment contractors in view of other demands and government manning inflexibility?

DISCUSSION:

The answer to this question is yes, provided:

a. The Agency's need and priority is such that we are willing to make an essential minimum investment in people and dollars on a continuing basis.

b. Key management personnel are experienced in management of system development.

c. The system is modular and the number of modules to be integrated is reasonable.

d. Service contracts are used to supplement staff personnel for tasks such as preparation of system specifications, system integration, performance analysis, etc.

The initial design services contract is for the acquisition of services which the government cannot effectively perform. This contract, or one like it, may be expanded for the detailed system test and integration activities as the system is brought together or this task can be accomplished under one of the development contracts later in the program.

The project staffing level has been held to the number required for operations when the development is complete. This will result in shifting of staff but not in net reductions in personnel. Staffing beyond this level will be obtained under contract.

The current staff is minimally concerned with the support of their previous activities within the Agency since all have either made a clean break with their previous organizations or have been obtained from the outside. (This support normally infringes upon project work).

It is the Agency's task to define the system which satisfies its needs. This has been achieved to a substantial degree by the generation of the Functional Requirements document. In view of

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the difficulty encountered in generating this document and the probable change in requirements for the system as experience is gained in its use and as more analysts review their needs in more depth, it is apparent that we need a project arrangement that will accommodate changes to the design of the system and which has the ability to make changes where necessary with a minimum of project disruption. This continuing evaluation and accommodation must be done by the Agency.

In the event of difficulty encountered in acquiring the additional personnel needed in FY-79 and 80, then contract personnel will be used to fill these needs, as they are more flexible in terms of acquisition and disposition.

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ISSUE #3 (h)

How can we engage the large software expertise of the DDS&T in the project?

Modes of Utility

One mode of engagement when personnel are found with large software program expertise is to transfer them into the SAFE Project. There are slots available at levels, 12-13 and 14 and candidates are being sought to fill these positions from within ODP, DDS&T and Agency-wide.

It should be noted that a part of the expertise in software development is made up of ODP personnel on rotational assignment to DDS&T. These people are being assigned upon their return to ODP from DDS&T, where appropriate.

D/ODP has asked DDS&T to suggest members for advisory boards, transfer candidates and Technical Advisory Panel membership. The response is not expected until more is known of the contractor/Agency relationship and thus of the type of personnel which would be appropriate. (Available talent is primarily GS-15 and above).

As part of an effort to utilize in-house talent, personnel in DDS&T and ODP have already been asked to review prospective designs of the SAFE system. This process will be formalized in the form of advisory boards. These boards would review various design documents and implementation plans with the objective of generating constructive criticism for the direction of the project. The use of such boards as an approval mechanism would not be tolerable.

The actual method of engagement and the relative value is dependent upon the nature of the expertise and its current and continuing availability. This will be examined further with DDS&T.

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